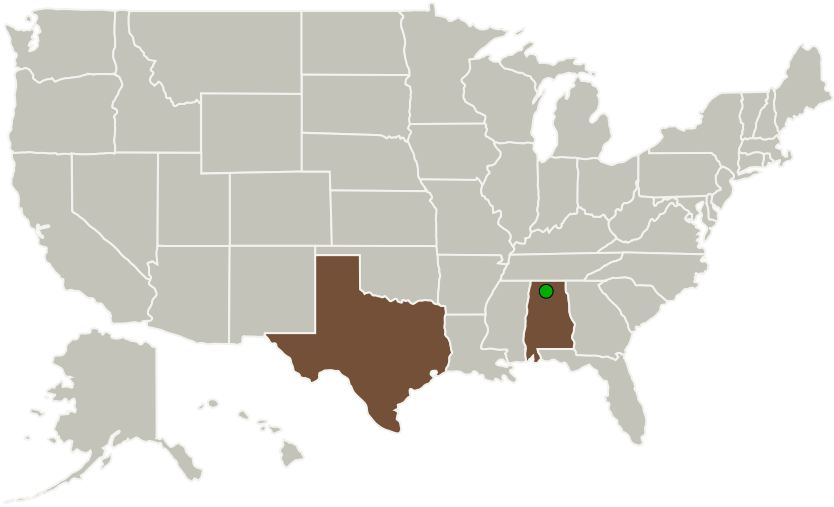
Non-Thermal Plasma Recovery of Hydrogen from Sabatier Waste Methane, Phase I

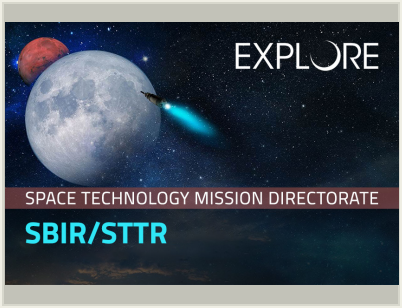
Completed Technology Project (2010 - 2010)

Project Introduction

Effective methods for recovery and regeneration of cabin atmosphere to supply oxygen are critical to facilitate extended duration manned missions including expeditions to Mars or a return to the Moon. Currently, oxygen is recovered as water using the Sabatier reduction process. One of the by-products of this reaction is waste methane, which is vented into space. Lynntech proposes to reclaim the hydrogen from the methane by utilizing a low power, high efficiency, non-thermal plasma (NTP) process based on high frequency dielectric barrier discharge (HFDBD). The HFDBD is characterized by electrons and heavy particles being in thermodynamic non-equilibrium. The electron temperatures are near 10,000K, while the ions and neutrals species remain at ambient temperature. The high energy electrons have the potential to recover up to 75% of the hydrogen from methane. Since the majority of the electrical energy in the discharge is used to accelerate electrons rather than heat the plasma gas, Lynntech's process produces minimal soot. Hence, a complex filtration system to remove soot from the exhaust stream is not required. Recovery of hydrogen from methane minimizes the hydrogen resupply requirements and improves the efficiency of the Sabatier process by closing the mass loop of the reduction reaction.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Lynntech, Inc.	Lead Organization	Industry	College Station, Texas
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Texas

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139287)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Lynntech, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

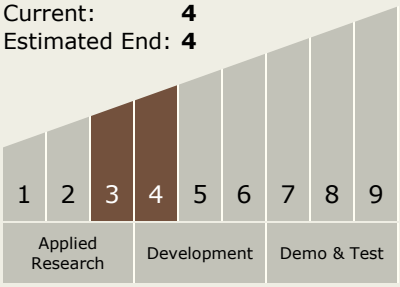
Carlos Torrez

Principal Investigator:

Paul Spence

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Completed Technology Project (2010 - 2010)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.3 Waste Management

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System